TRILOGY

By PTI

Service Manual

Revision B. 06/20/07

TABLE OF CONTENTS

Section 1 : General Information

1.1 Introduction 1
1.2 Identification
1.3 Model Number Description
1.4 Serial Number Description 2
1.5 Delivery & Storage
1.6 Features
1.7 Stackerless Dimensions 3
1.8 Stacker Dimensions 4

Section 2 : Installation

2.1 Introduction 5
2.2 Installation Using Faceplate Adapter Kit

Section 3 : Operation

3.1 Stacker Component Explanation 6
3.2 Stackerless Component Explanation 7
3.3 Currency Recognition / Validation 8
3.4 Currency Acceptance / Rejection
3.5 Currency Stacking (Stacker Only)
3.6 Machine Interfaces
3.7 Acceptor Diagnostics Using the Pushbutton 9
3.8 Front Bezel Lighting Flash Codes 10

Section 4 : Configuration

4.1 Using the Configuration Card 11-12
4.2 Configuration Procedure 13
4.3 Using a PC with Trilogy
4.4 Downloading the Trilogy Tools Software

Section 5 : Disassembly

5.1 Stackerless Back Plate Removal 14
5.2 Stacker Cash Box Removal
5.3 Lower Sensor Plate Removal 15
5.4 Front Bezel Removal 16
5.5 Upper Sensor Plate Removal 17
5.6 Disassembling the Upper Sensor Plate
5.7 Disassembling the Lower Sensor Plate 18
5.8 Cleaning and Maintenance 19

Section 6 : Parts List

6.1 Cash Box Assembly 20
6.2 Lower Sensor Plate Subassembly 21
6.3 Upper Sensor Plate Subassembly 22
6.4 Upper Sensor Plate Drive Train Assembly 23
6.5 Stacker Motor Gear Box Subassembly 24
6.6 European Bezel- 85mm Width 25
6.7 European Bezel w/ Width Reducing Inserts 26
6.8 USA Style Bezel 27
6.9 SP Bezel- 82mm Width 28

1.1 Introduction

Thank you for purchasing a Trilogy Stacker/Stackerless bill acceptor. This manual explains how to operate, maintain, and troubleshoot the Trilogy bill acceptor. The service manual was designed to help customers, shop personal, and field operators to better understand the acceptor, as well as keep the acceptor performing at its maximum potential.

1.2 Identification

Each Trilogy bill acceptor is identified by a model number and serial number, located on the bottom side of the unit. The serial number identifies the year it was made, the week it was manufactured, and the unit number. The model number identifies, the series, bezel type, cashbox size, P.S./comm., and country. The serial and model numbers are important to know if you make a service call. This information is very helpful to our tech support team.

1.3 Model Number Description

Series	Bezel Type	Cashbox	P.S./Comm.	Country
T5	X	X	X	XXX

Bezel Type

1- Euro Style Bezel, No Inserts (Notes up to 85 mm in width)
2- USA Style Bezel (Notes up to 66 mm in width)
3- USA Style Bezel (Notes up to 72 mm in width)
4- USA Style Bezel (Notes up to 74 mm in width)
5- USA Style Bezel (Notes up to 82 mm in width)
6- USA Style Bezel (Notes up to 85 mm in width)
7- Euro Style Bezel with 66 mm Inserts (Notes up to 66 mm in width)
8- Euro Style Bezel with 72 mm Inserts (Notes up to 72 mm in width)
9- Euro Style Bezel with 74 mm Inserts (Notes up to 74 mm in width)
0- SP Bezel (Notes up to 82mm in width)

(Note: Bezel Types 1, 7, 8, 9, 0, are for Stackerless use ONLY)

Cashbox

N- None (Stackerless only)
C- 500 Note Cassette, No Lock
D- 500 Note Cassette, With Lock

Power Supply/Communication Options

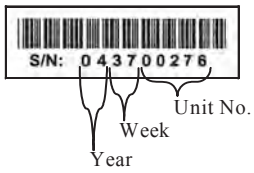
1- 12 VDC Pulse Mode only (4-pin harness included)
2- 12 VDC Parallel/Parallel Binary and CC-Talk Operation (16-pin harness included)
3- MDB Option
4- 12 VDC USB Operation (4-pin power and USB harness included)

Country Code

Follows ISO three (3) digit Country Code.
Example: EUR = Euro notes
USA = USA notes

1.4 Serial Number Description

Example Serial Number:



In this example, the first two digits are the year of manufacture (**2004**).
The week of manufacture is week **37** of 2004.
The sequential production serial number is **00276**.

Notes for CC-Talk: The last six digits of the Serial Number are used as the Encryption Key when using CC-Talk Encrypted Mode of operation.

1.5 Delivery & Storage

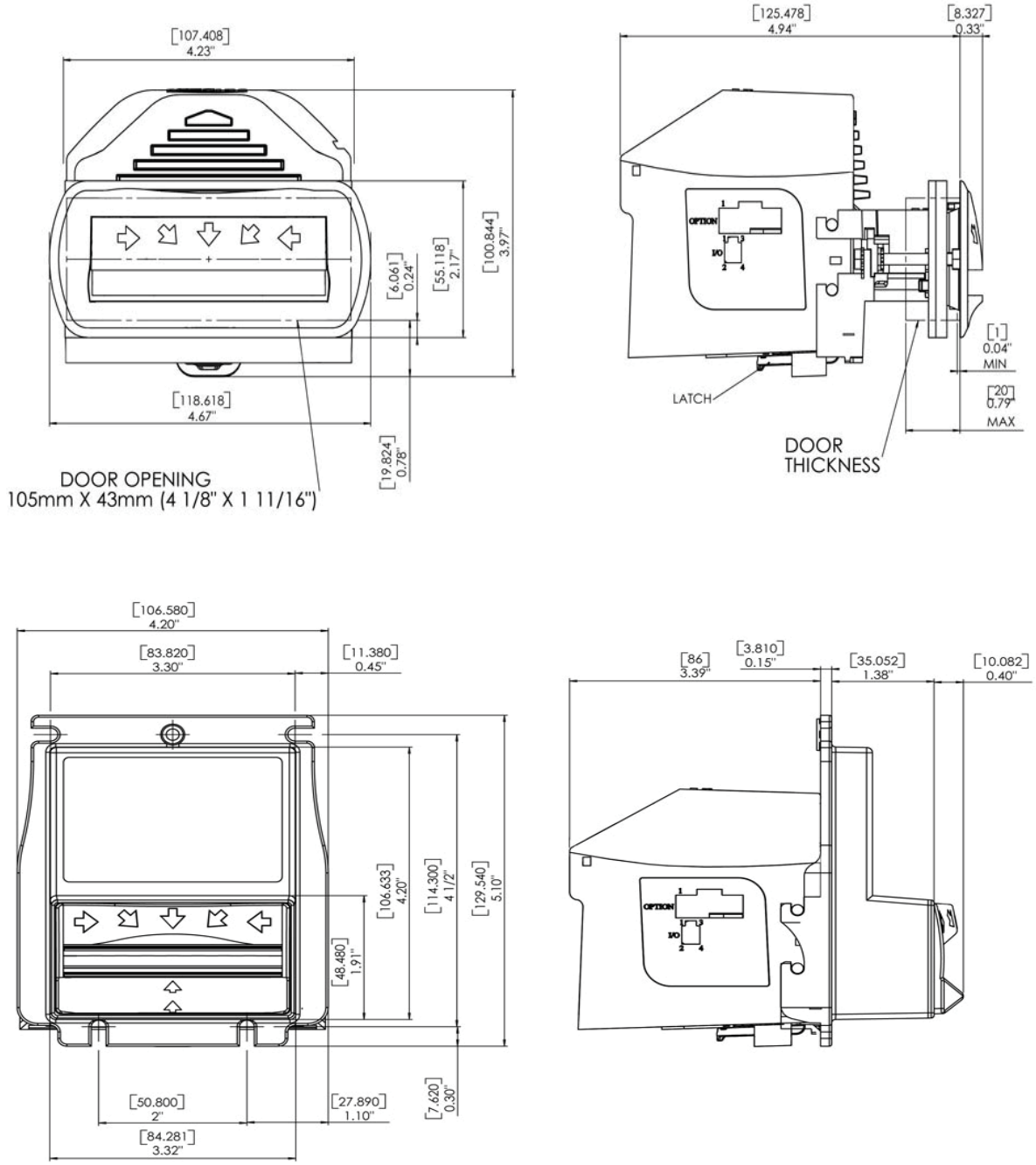
When you receive your Trilogy bill acceptor, please examine it for any damage that might have occurred during the shipping process. If damaged, notify your shipper immediately.

- If you are storing your Trilogy bill acceptor, always keep it in its original packaging to protect the unit from damage.

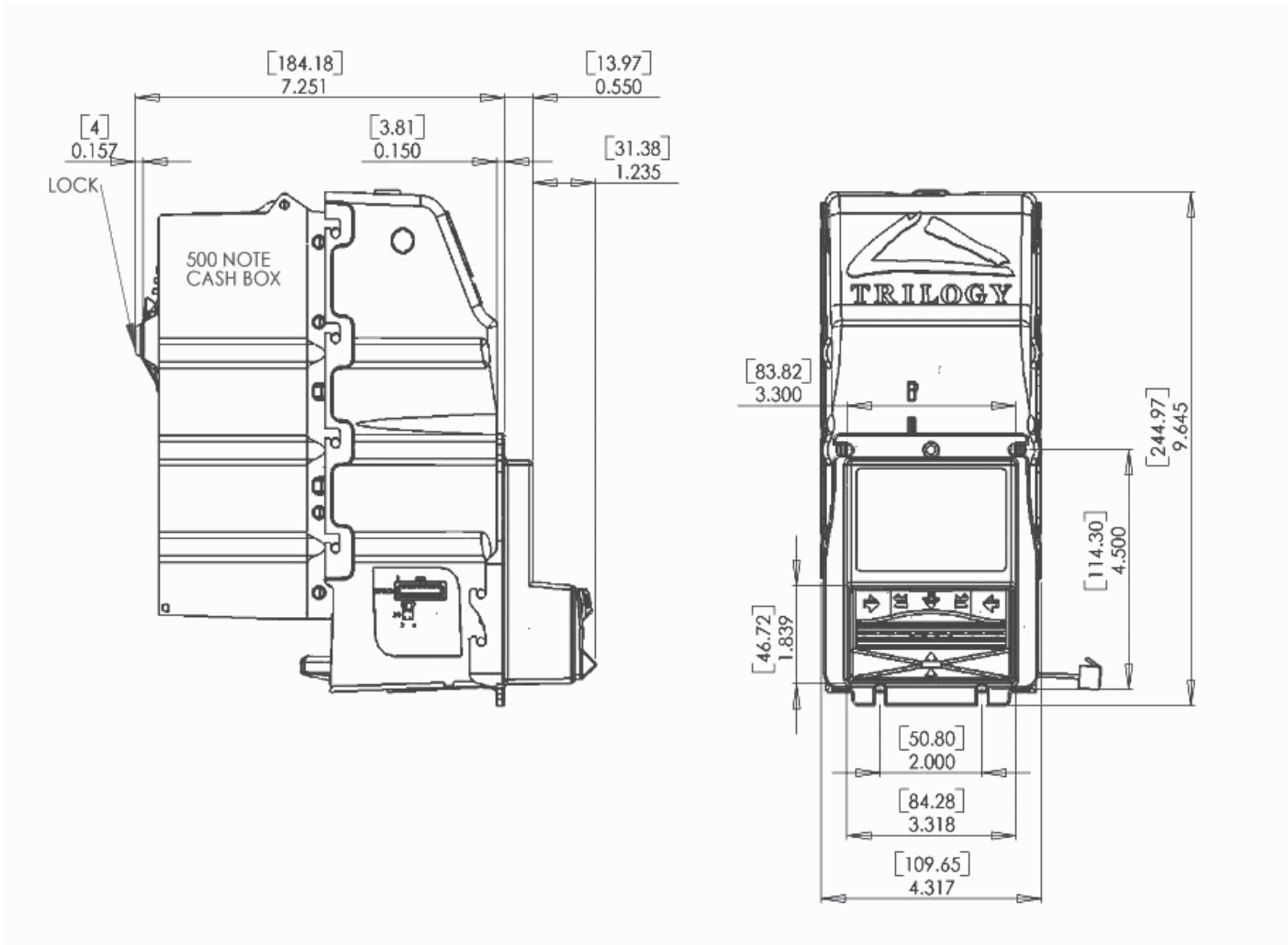
1.6 Features

- Lockable / removable cashbox (stacker version only)
- Lighted arrows on bezel.
- High security against fraudulent notes.
- Flash downloadable software using a PC (Currency updates are free of charge).
- On-board pushbutton/LED and advanced diagnostics via PC.
- Many interfaces available: Pin-outs compatible with other manufacturers' note acceptors.
- Dual-stage optical anti-stringing.
- Simple configuration and setup.
- 12 VDC (+/- 10%) operation.
- Removable note path for easy cleaning.
- Can handle notes up to 85 mm wide.

1.7 Stackerless Dimensions (*Figure 1*)



1.8 Stacker Dimensions (*Figure 2*)



2.1 Standard Installation

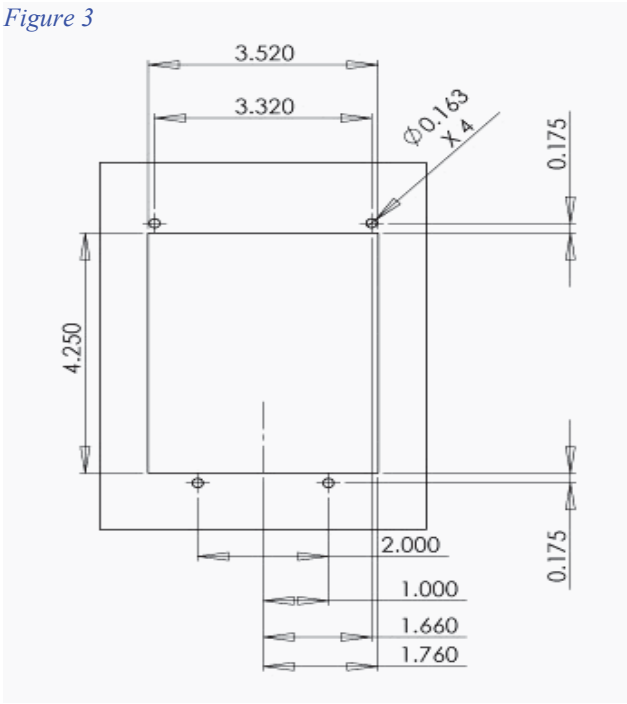
(see Figure 3)

Standard installation is when the acceptor is mounted directly to the host machine with no adapter bracket.

Figure 3 shows the recommended cutout size to mount the acceptor. The studs on the host machine should be long enough to ensure secure mounting.

On Stacker models, make sure nothing on your machine interferes with the acceptor mounting. There should be no studs or protrusions on your machine that can touch or hit the stacker above the front bezel.

Figure 3



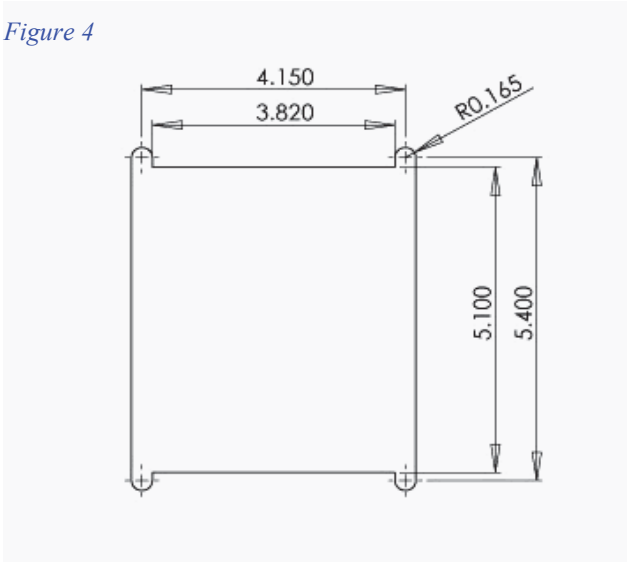
2.2 Installation Using Pyramid's Faceplate Adapter Kit

(see Figure 4)

This mounting technique uses our Adapter Bracket Kit.
Part #9A002.

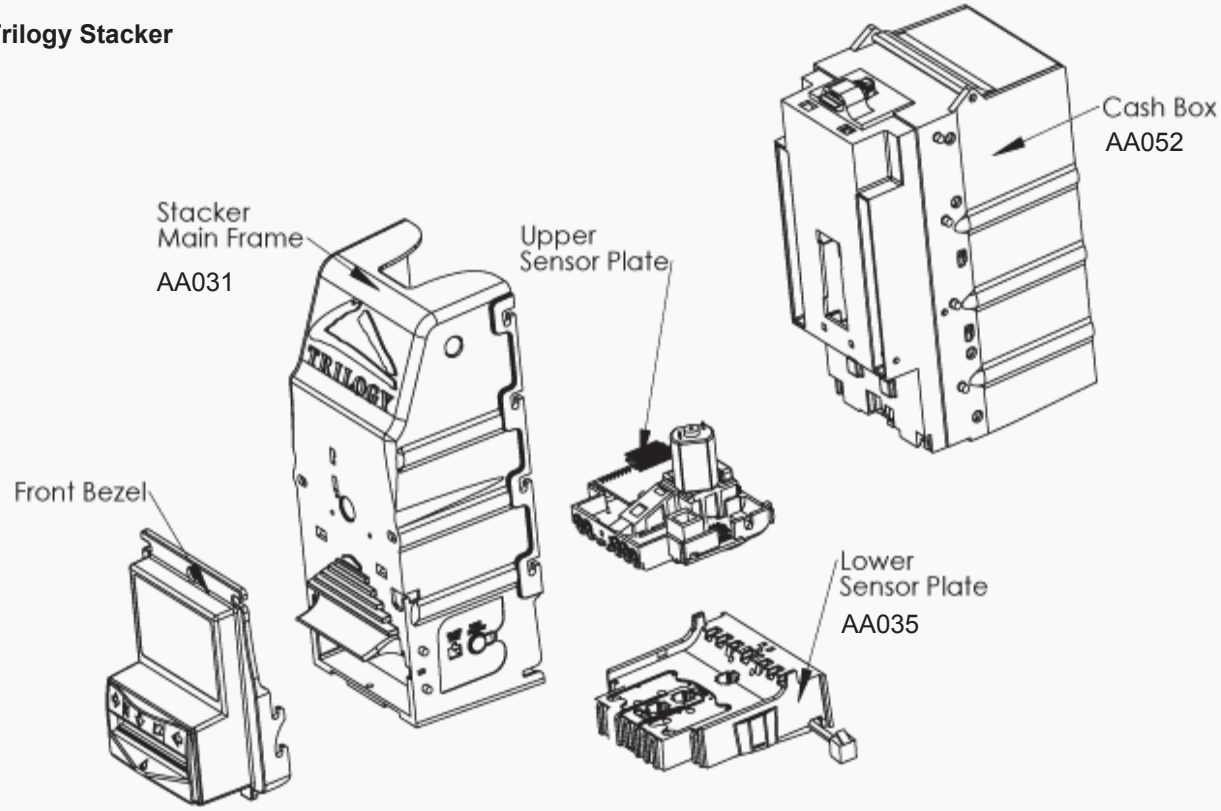
Figure 4 shows the dimensions of the cutout size for this bracket. Use the provided spacers, washers and nuts to make sure the unit is mounted securely.

Figure 4



3.1 Stacker Component Explanation (*Figure 5*)

Trilogy Stacker

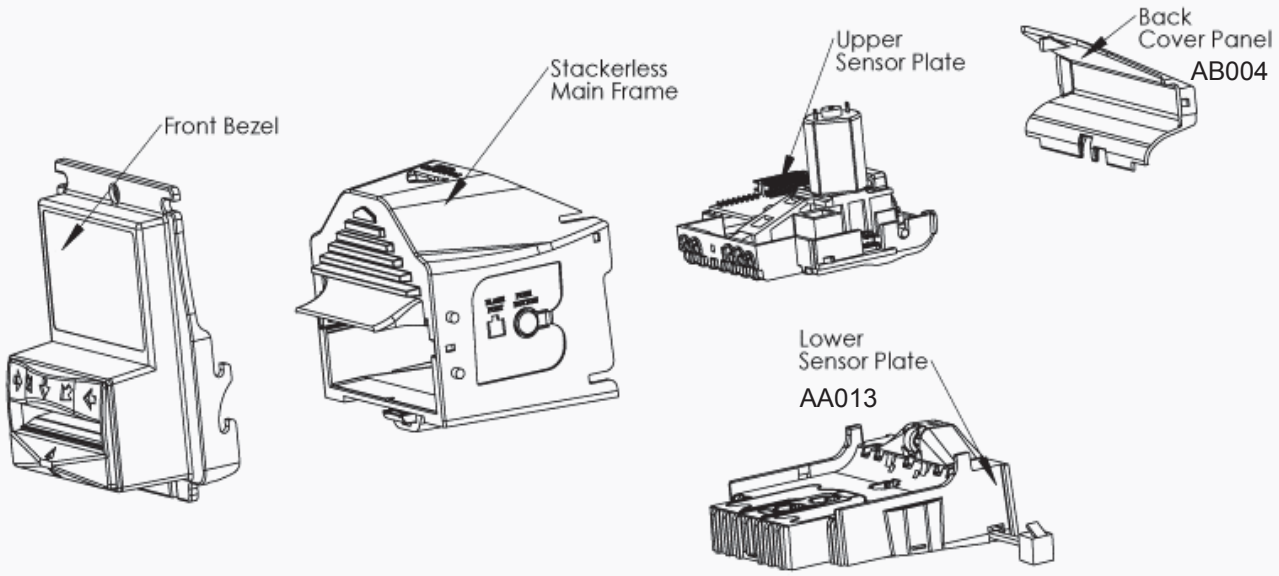


Front Bezel Options
AA005 66mm USA Style (Shown)
AA006 72mm USA Style
AA007 74mm USA Style
AA014 82mm USA Style
AA015 85mm USA Style

Upper Sensor Plate Options
AA032 w/o Option Board (Shown)
AA032 w/ CC-Talk Board
AA055 w/ MDB Board

3.2 Stacker Component Explanation (*Figure 6*)

Trilogy Stackerless



Front Bezel Options
AA004 85mm Euro Style
AA005 66mm USA Style (Shown)
AA006 72mm USA Style
AA007 74mm USA Style
AA014 82mm USA Style
AA015 85mm USA Style
AB664 66mm Euro Style w/Inserts
AB724 72mm Euro Style w/Inserts
AB744 74mm Euro Style w/Inserts
3B007 82mm SP Bezel

Stackerless Main Frame Options
AB002 w/o Option Board (Shown)
AB003 w/ Option Board

Upper Sensor Plate Options
AA010 w/o Option Board (Shown)
AA011 w/ CC-Talk Board
AB005 w/ MDB Board

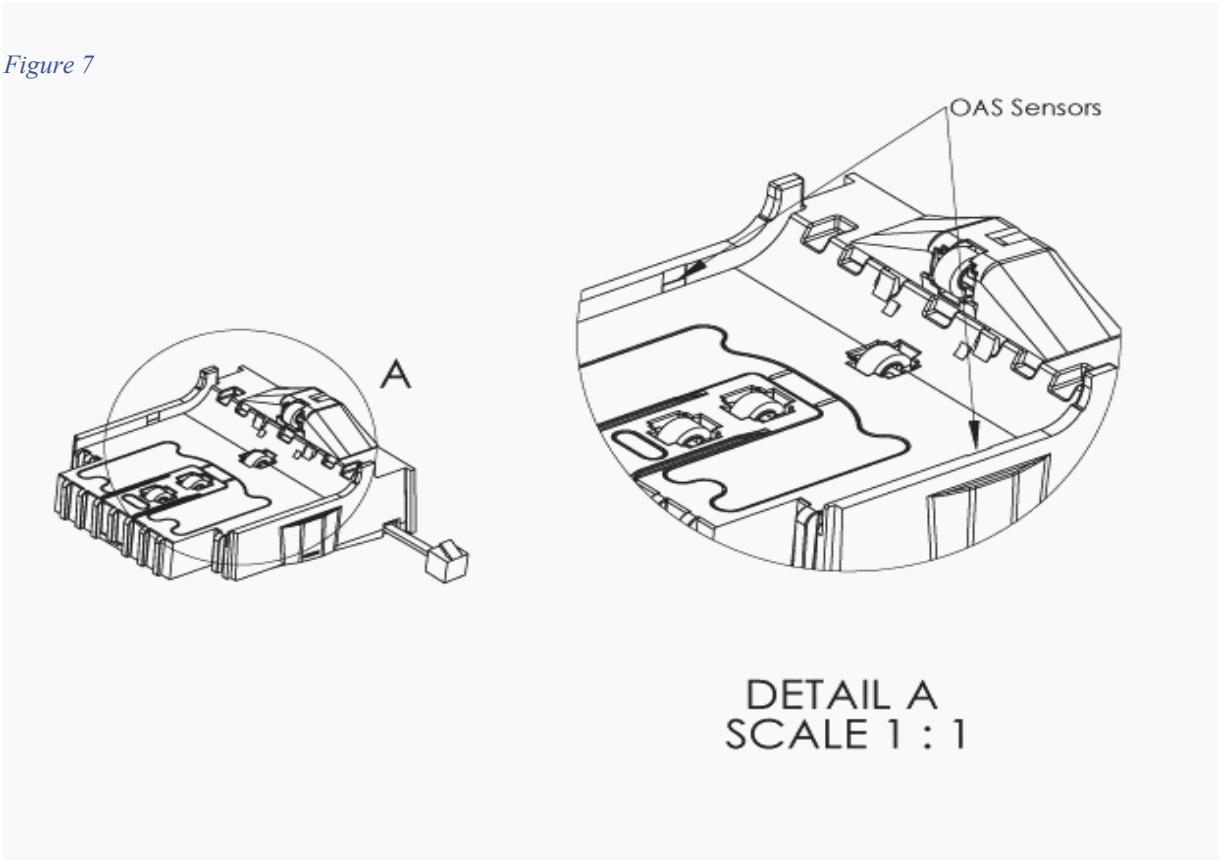
3.3 Currency Recognition / Validation

The Trilogy acceptor uses 8 optical sensors, reading light signals reflected off the bill's surface, as well as light passed through the currency.

3.4 Currency Acceptance / Rejection

The Trilogy acceptor draws the bill into the bill path and collects data on the currency. If the bill is determined to be invalid, the bill will be returned to the user. If the bill is valid, the acceptor will feed the bill past the Optical Anti-Stringing Sensor (OAS) (*see **Figure 7***). The OAS determines if any tape or string is attached to the bill. If no tape or string is attached, the bill will be fed out the back of the acceptor (Stackerless Model) and credit is issued.

Figure 7



3.5 Currency Stacking (Stacker Model Only)

Once a bill is accepted and fed into the stacker, the stacker punch will cycle and securely push the bill into the cashbox. Credit information is then sent to the host.

3.6 Machine Interfaces

The Trilogy supports nearly every bill acceptor interface available. For more details please refer to the **Power Supply / Communication** Section on Pg. 1.

3.7 Acceptor Diagonstics w/ Pushbutton

(see Figure 8)

To enter the Diagnostic Mode, the acceptor must have power.

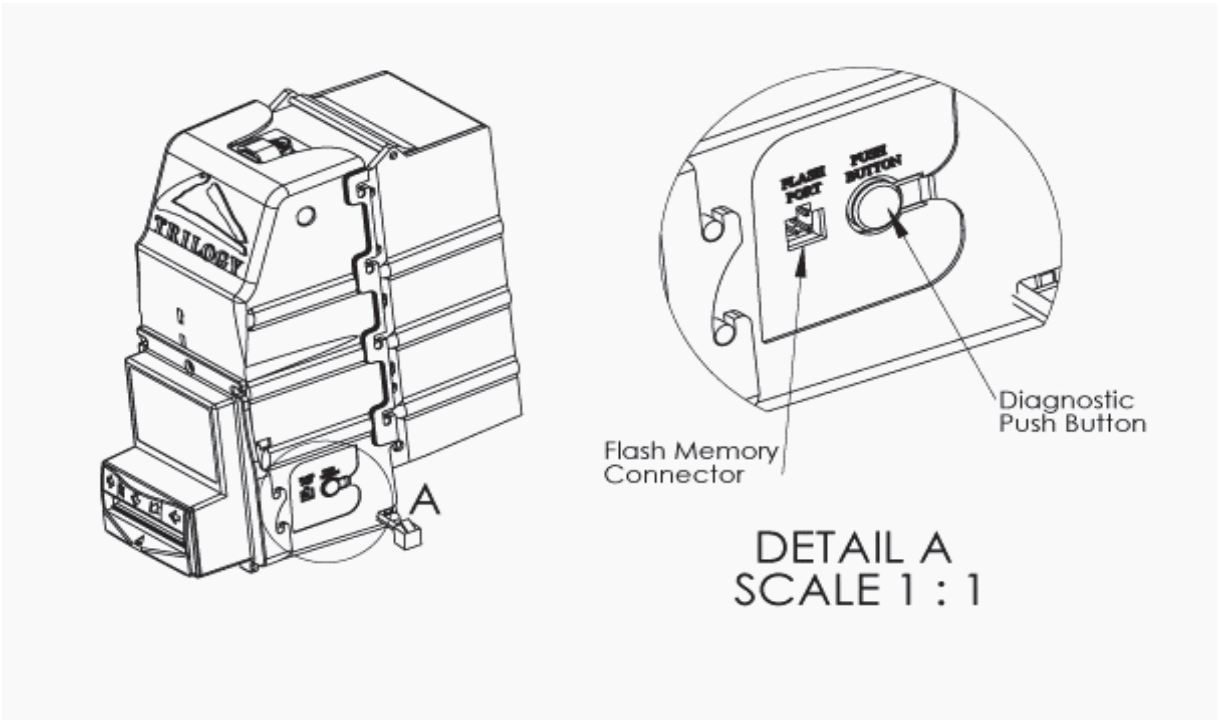
Push and hold the Diagnostic Pushbutton. Hold it for at least one (1) second, but no more than five (5) seconds, then release.

The lights on the front bezel will flash a certain number of times to indicate a specific error condition. The number of times the lights flash corresponds to the error code listed on page 10, and can also be found on the back of the acceptor.

To exit this diagnostic mode, press and hold the button again for at least 1 second (but not longer than 5 seconds). The acceptor will also exit this mode automatically after about 30 seconds.

Note*: *Holding it longer than 10 seconds will put the acceptor into a Configuration Mode and it will expect to have the Configuration Card inserted next. If you have accidentally entered this mode, cycle

Figure 8



3.8 Front Bezel Lighting Flash Codes

The flash codes shown correspond to the Trilogy bill acceptor error. The acceptor will flash the error code, then wait 3 seconds and flash it again.

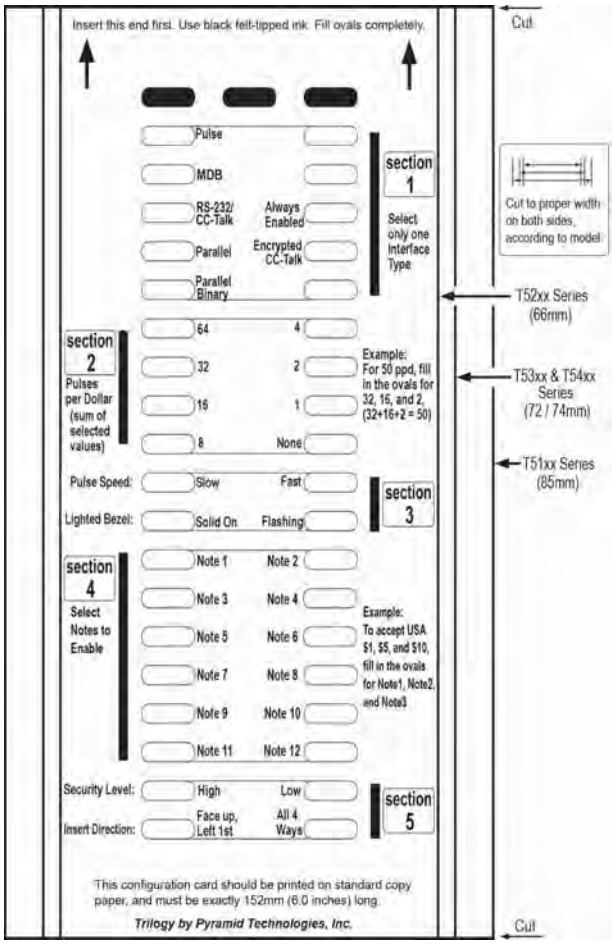
Flashing Code	Meaning of Flashing Code	Corrective Action
LED's always OFF	The acceptor has no power.	Check that power has been applied.
LED's always ON	No error exists- acceptor is OK.	None.
1 Flash	Something is obstructing the bill path.	Remove the cassette and Lower Sensor Plate to inspect for foreign objects. Clean if necessary.
2 Flashes	Something is obstructing the stacker.	Remove the cassette and Lower Sensor Plate to inspect for foreign objects. Clean if necessary.
3 Flashes	The cassette is full of currency.	Remove the cassette and empty it.
4 Flashes	The cassette has been removed.	Replace the cassette.
5 Flashes	The acceptor is defective.	Replace the acceptor.
6 Flashes	The acceptor is not enabled.	Verify that the host has enabled the acceptor, and is configured correctly.
10 Flashes	Configuration Mode has been entered.	Configuration Card must be inserted into the acceptor or cycle power to the acceptor to exit this mode. See Configuration Section for details.
Rapid Flashing During Operation	The acceptor has detected a stringing attempt, or the optical ant-stringing sensor is dirty	Remove the Lower Sensor Plate and clean the optical anti-stringing sensor pair openings. These sensor openings are located on the Lower Sensor Plate to the far left and right of the bill path (*see Figure 7*). Clean all of the sensors at this time, both the entire upper and lower halves of the bill path. Reinstall the Lower Sensor Plate and cycle the power.

4.1 Using the Configuration Card

The Trilogy acceptor can be configured using a Configuration Card. See the Trilogy Acceptor Operating Manual for actual configuration cards. This is explained in detail in the next section.

The Configuration Card shown below is for *example only*!
Use the card in the back of the Trilogy Operating Manual to configure the unit.

Once configured with the card, the acceptor will remember these settings, even if power is removed.



When you fill in the card, use a black felt tip marker and fill the selected block completely making sure no marks are outside the block.

Note: As a service to our customers, Pyramid Technologies, Inc. will configure each acceptor according to your requirements, free of charge. Please specify this information when ordering.

Additional Cards can be found on the website www.pyramidacceptors.com/support.html under the document Trilogy_Config.pdf.

Configuration Card Section	Description
Section 1 (Configuration Type) These lines select the type of Interface that you want to use. **If you are unsure about your selection, see the Interface Section of this manual.** You can select only one interface type.	**Pulse-** Pulse mode of operation. **RS-232/CC-Talk**- RS-232 using a USB Port or CC-Talk protocol. *** (*** See configuraton notes.) **Encrypted CC-Talk**- Uses Encrypted CC-Talk Mode of operation. **Always Enabled**- Acceptor always enabled mode. **Parallel** - Parallel mode of operation **Parallel Binary**- Parallel Binary mode of operation. **MDB-** Multi Drop Bus mode of operation.
Section 2 (Pulse per Dollar) These lines select the Pulses Per Dollar. For Pulse mode, fill in the Blocks to add up the total number of Pulses Per Dollar that you desire.	Fill in the Blocks to add up the total number of Pulses Per Dollar (or bank note Denomination) that you desire. For example, if you want ten (10) pulses per dollar, fill in the "8" and "2" Blocks. Fill out "None" if you are not using any type of pulse mode.
Section 3 (Pulse Speed) This line selects the Slow or Fast Pulse. The Slow Pulse (for USA) is a 50 msec on, 300 msec off pulse. For European countries, the Slow Pulse is 100 msec on, 200 msec off. The Fast Pulse for both is a 50 ms on, 50 ms off	Fill in the appropriate Block. **Note: If you are not using the pulse mode, don't fill out this section.** **Note: In the Parallel or Parallel Binary modes of operation, the pulse speed is not selectable.**
Section 3 (Lighted Bezel) This line selects how the Bezel lighting will appear to the customer. The Bezel can be selected to be always on or flashing when the acceptor is enabled. In either case, the Bezel is off when the acceptor is disabled, or when the acceptor has a problem.	Fill in the appropriate block. You must select one of the options here.
Section 4 (Enable Notes) These lines determine which notes you want enabled. Note 1 is the lowest denomination for that particular country.	Fill in the appropriate Block to enable a note.
Section 5 (Security Level) This line is used to select the security of the bill acceptor. Select either low or high security.	Low security should be used when the environment is monitored by personnel, or when the user knows that the likelihood of counterfeiting is low. High security should be selected for environments that are not monitored, or when the acceptor is configured to accept high denomination currency. You must select one option.
Section 5 (Insert Direction) This line is used to select the direction of bill acceptance. Bills can be accepted in all four directions or "Face up, left" which means face up, black seal first.	Select the appropriate direction of insertion. You must select one option.

Configuration Notes: **A T5XX2 Series Acceptor is needed to support the CC-Talk, Encrypted CC-Talk protocol, Parallel, Parallel Binary and European style Pulse mode.**

***** A T5XX4 Series Acceptor is needed to support the RS232 protocol using a USB port. This model includes a USB Power Cable (P/N 5A006)**

***** USB/RS-232 Operation requires special Trilogy Software for proper operation. Consult your distributor or PTI for this software.**

4.2 Configuration Procedure

- Make sure power is applied to the bill acceptor.
- Press and hold the Diagnostic Pushbutton located on the left hand side of the bill acceptor (looking at the acceptor from the rear). Hold the Diagnostic Push button for at least ten (10) seconds, then release.
- The bezel lighting on the front of the acceptor will flash ten (10) times.
- Insert the Configuration Card into the acceptor, arrows first, printed side face up.
- The acceptor will hold the Configuration Card for a second or two, then feed it back to you.
- If the bezel lights are flashing rapidly, the acceptor has read the Configuration Card correctly. The configuration is now in permanent memory in the bill acceptor. The acceptor will reset itself. You can now begin using the acceptor.
- If the bill acceptor has not read the Configuration Card correctly, the bezel lights will flash slowly a certain number of times. The number of flashes will tell you which Section of the card it cannot read correctly. If this occurs, make sure that section is filled in neatly. The bill acceptor will stay in the Configuration Mode until it has correctly read a Configuration Card, or if you remove power to the acceptor.

4.3 Using PC with the Trilogy

Using a PC, you can diagnose problems, set the configuration, and reprogram the acceptor with new software updates. You can download the required software utility from our website for free (see below.)

To be able to use this feature you need to purchase the required Flash Interface Harnesses; P/N 05AA0026.

The Flash Interface harness should be plugged into the 6-pin connector on the side of the acceptor (see Figure 8). The acceptor must be powered up to communicate with a PC.

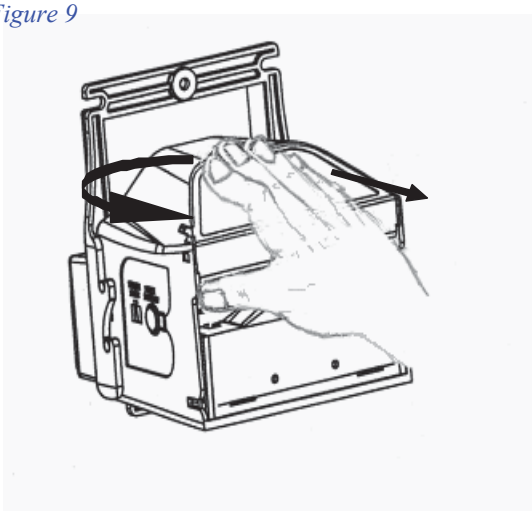
4.4 Downloading the Trilogy Tools software

Please visit the “download” section of our website (www.pyramidacceptors.com). Download the “Acceptor Tools for PC.” The software is simple to use. Should you need assistance please follow the “Acceptor Tools Instructions” located on the “download” page.

5.1 Stackerless Back Plate Removal

For stackerless you must remove the rear cover by pulling each side off individually. (***see Figure 9***) For the remaining disassembly, refer to the stackered information below. *The stackerless acceptor is easier to disassemble, so many of the steps for the stacker will not apply to the stackerless.*

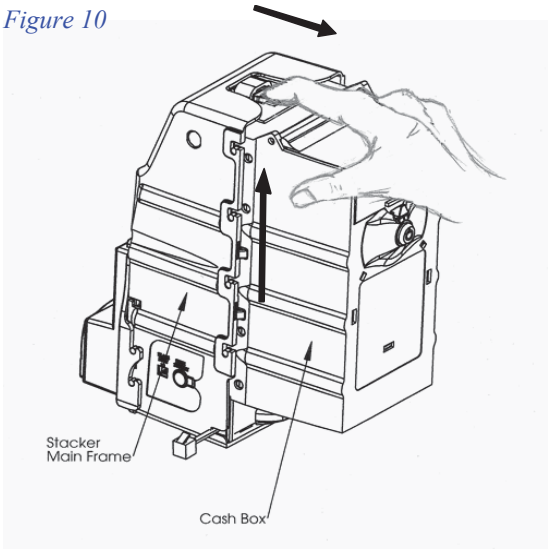
Figure 9



5.2 Stacker Cash Box Removal

For the stackered acceptor, remove the cashbox ***(see Figure 10).***
Push back the Cashbox Latch toward the front of the acceptor. Pull the Cash Box upward, and then pull back to remove.

Figure 10



Notes:

Disassembly of the acceptor typically does not require re-calibration of the acceptor, provided you are careful during re-assembly and make sure no sensors become bent or misaligned.

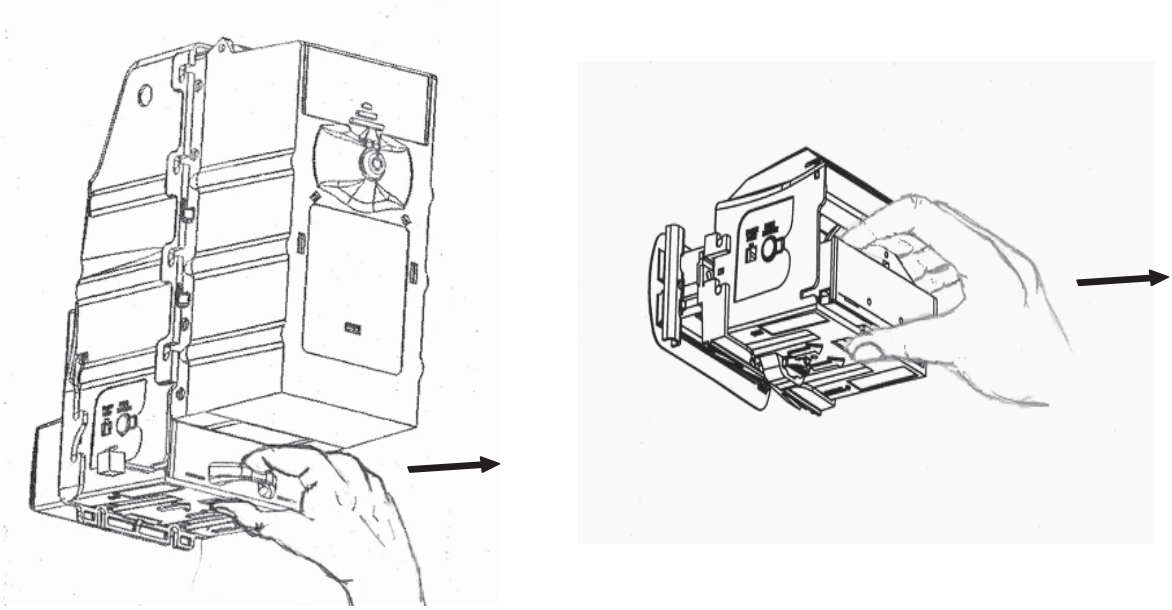
Re-calibration is always necessary any time a printed circuit board is replaced in the acceptor. Re-calibration can only be performed by authorized service centers, or the Pyramid Technologies factory.

5.3 Lower Sensor Plate Removal

(see Figure 11)

Removal of the Lower Sensor Plate is done by pressing the locking tab in and pulling the plate back.

Figure 11



Note: Be sure the Lower Sensor plate "snaps" into place upon reassembly.

5.4 Front Bezel Removal

(*see Figure 12A & 12B*)

For the Stacker, remove the two screws as shown in *figure 12A*. This allows the bezel to be pulled down and away from the main housing.

For the Stackerless, actuate the bezel latch by pulling towards the rear of the acceptor as shown in *figure 12B*. This allows the bezel to be pulled down and away from the main housing.

Figure 12A

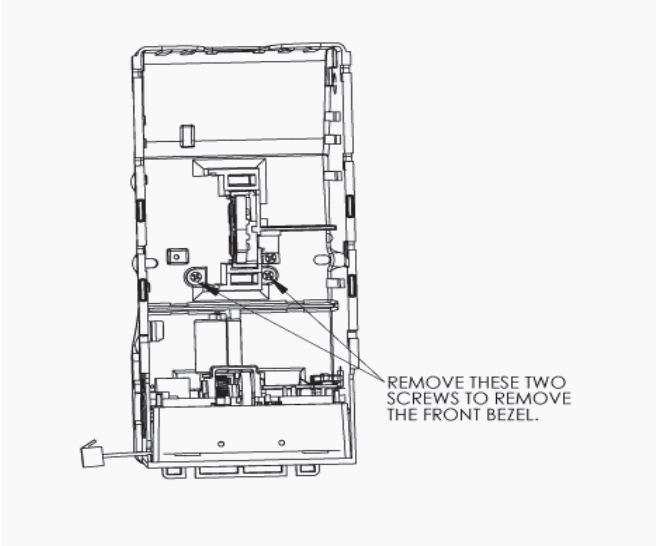
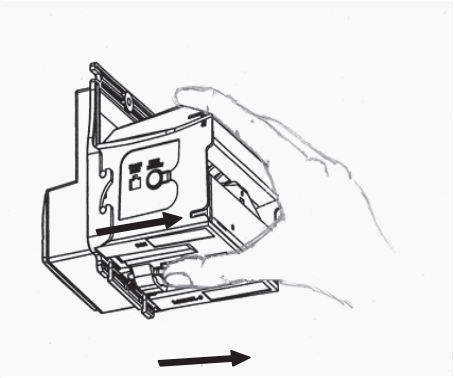
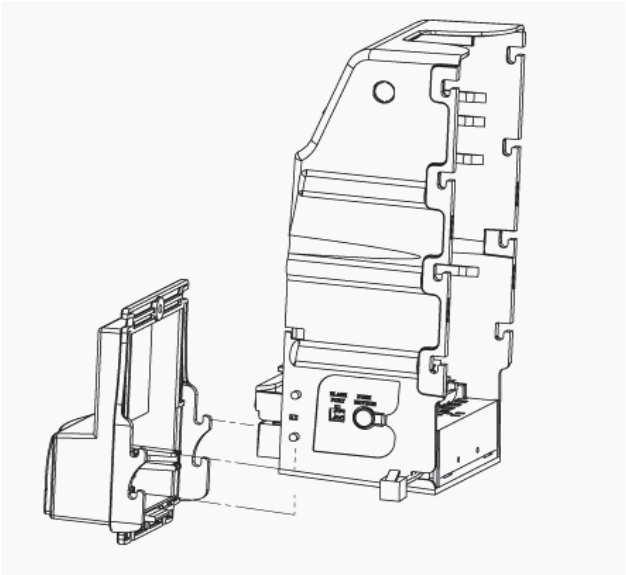
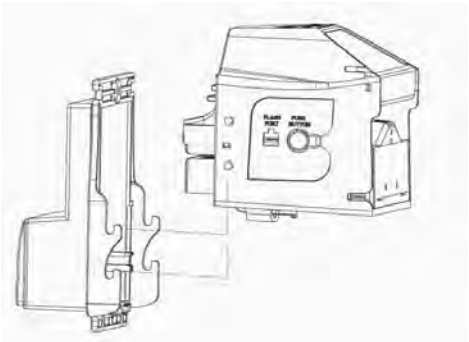


Figure 12B



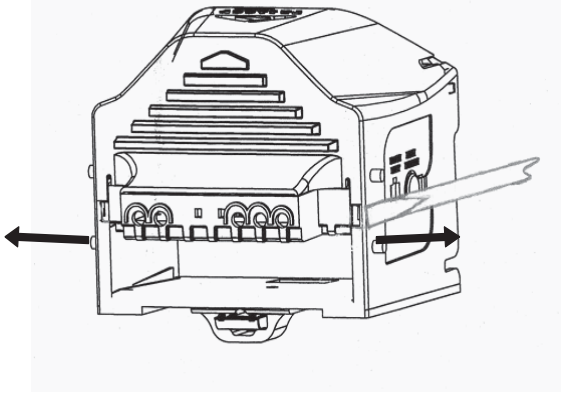




5.5 Removing the Upper Subassembly from the Main Housing
(see Figure 13)

After the Front Bezel, Back plate, and Lower Sensor assemblies are removed, the Upper Sensor Plate Subassembly can be freed from the Main Housing. Use a screwdriver to pry the plate from the main housing as shown in figure 13. Then the Upper Sensor Plate Subassembly is pushed backwards to dislodge it from the Main Housing. ***Use care as not to break the housing tabs!***

Figure 13

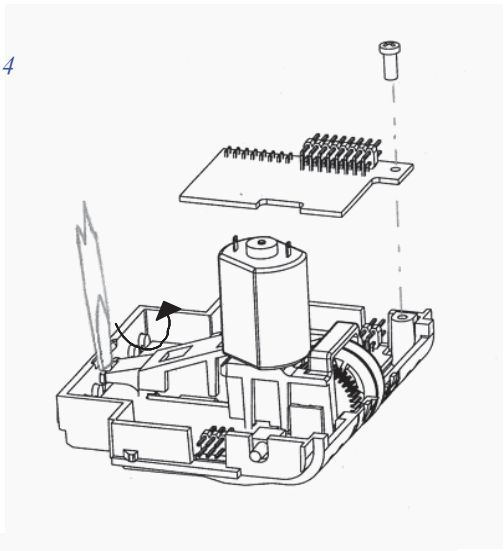


Note: Be sure the Upper Sensor plate "snaps" into place upon reassembly.

5.6 Disassembling the Upper Sensor Plate
(*see Figure 14*)

Use a screwdriver to detach the motor mount subassembly from the upper sensor plate as shown in *figure 14*. If an option board (shown in *figure 14*) is present, remove the screw that holds it down and carefully remove before using the screwdriver to dislodge the motor mount from the Upper Sensor Plate.

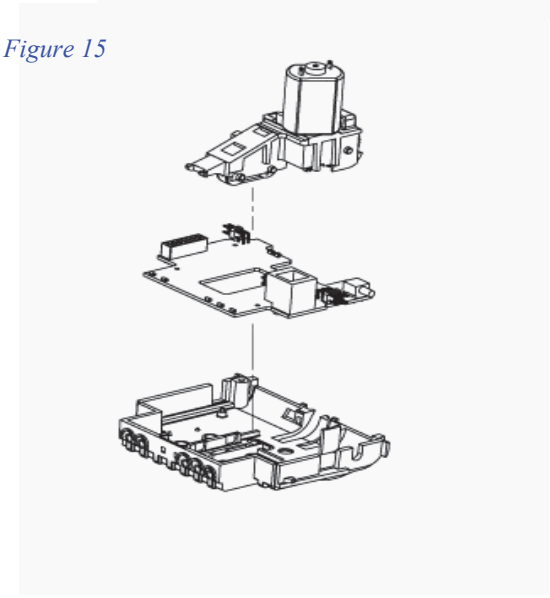
Figure 14



This will allow you to pull the motor mount subassembly and microprocessor board up and away from the upper sensor plate as shown in *figure 15*.

Note: The motor mount assembly is held in by tabs on each end. Be sure not to break these tabs upon reassembly.

Figure 15



5.7 Disassembling the Lower Sensor Plate
(*see Figure 16 & 17*)

Use a screwdriver to detach the the lower sensor plate cover as shown in *figure 16*.

This will allow you to pull the lower sensor board up and away from the lower sensor plate as shown in *figure 16*. You can then remove the cable from the lower sensor board by pressing the tab and pulling away.

In event that a roller needs replaced you may detach the roller with a screwdriver. This will free the roller from the lower sensor plate as shown in *figure 17*. The roller mount and spring can then be removed as shown in *figure 17*.

Notes: Besure that the following componets are secure upon reassembly.
-roller mounts
-rollers
-lower sensor board
-harnessing
-backplate
All plastic tabs should be "snapped" into place.

Figure 16

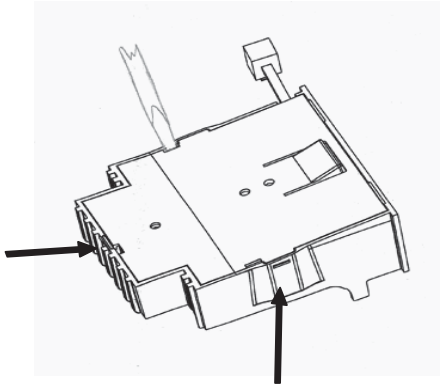
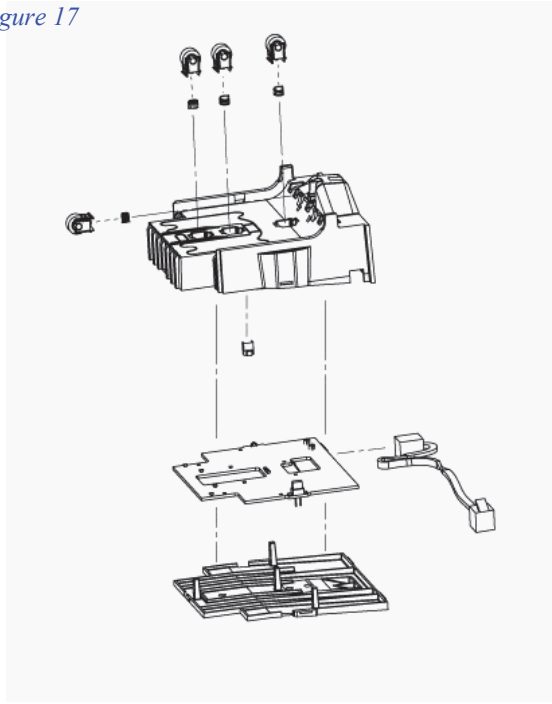


Figure 17



5.8 Cleaning and Maintenance

Note*: *The Trilogy Stacker/Stackerless bill acceptor may require a simple cleaning on occasion to remove excess build-up of dirt from the sensor lens areas. Do not use any solution that contains Acetone. This could damage some of the plastic and electronic components within the unit.

The Trilogy Stacker/Stackerless bill acceptor does not have a specific preventative cleaning time period. This depends on the environment and the customer's discretion. For example, acceptors used in smoke-filled, high use, or dirty environments will require more frequent cleaning, as will acceptors which have a high volume of daily use.

A clean, damp, lint-free cloth will often be sufficient, but for best results, use a 50/50 mixture of water and isopropyl alcohol. Carefully wipe down the inside of the acceptor and use a towel that does not leave towel "residue" or cloth in the acceptor. Pay close attention to cleaning the clear lenses and the oval-shaped gray plastic inserts located in the lower AND upper sensor plates. These gray inserts should be clean of any cigarette tar or other contaminants. Also ensure that the optical anti-stringing (OAS) sensors are cleaned. These are located in the inside edges of the lower sensor plate ***(see Figure 7)*.**

Note: If the unit is disassembled when cleaning, there are specific components that should be checked to ensure they are put back into place (see below).

Upper Sensor Plate Subassembly:

- Drive Belt
- Window
- Gray Plastic Insert
- All Gears

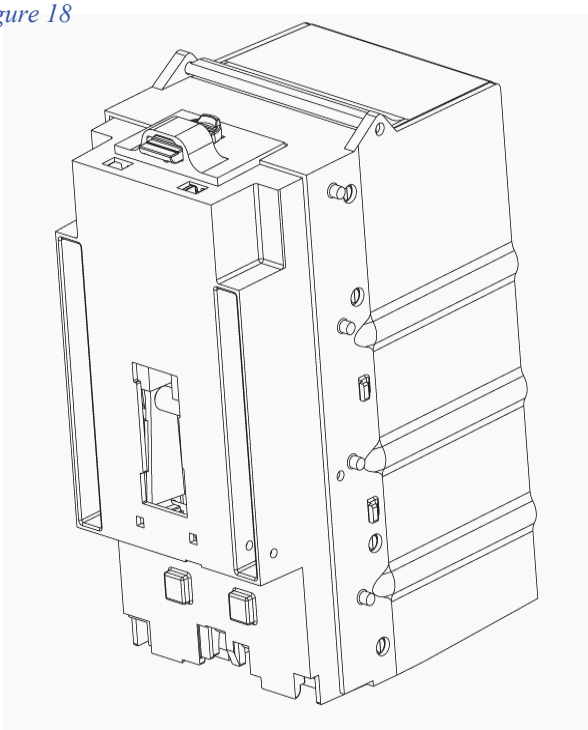
Lower Sensor Plate Subassembly:

- Roller Wheels
- Window
- Gray Plastic Insert
- Rear Roller Mount Assembly

6.1 Cash Box Assembly

(see Figure 18)

Figure 18

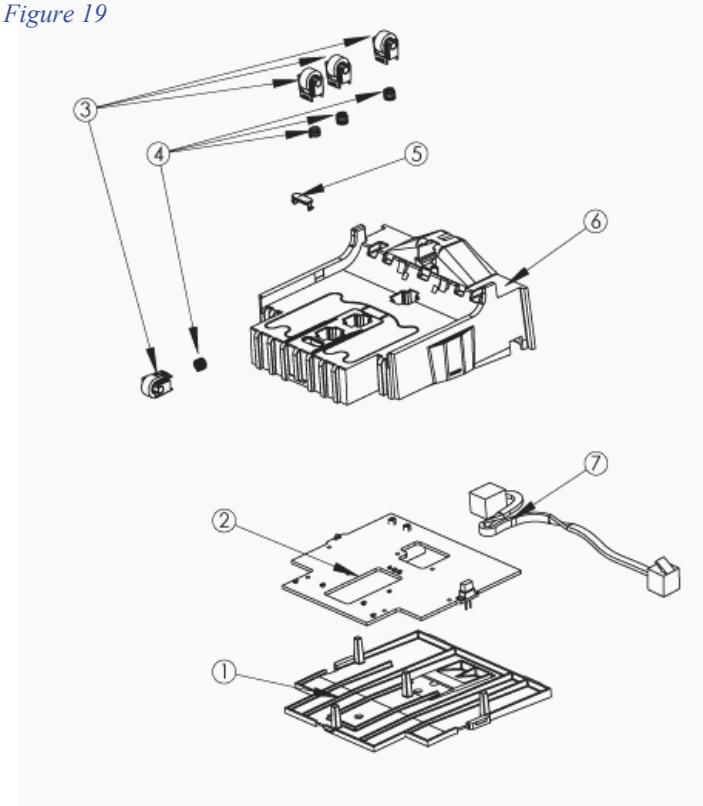


ITEM NO.	PART NO.	DESC.	QTY.
1	AA052	Cash Box Assembly	1

6.2 Lower Sensor Plate Subassembly- AA035

(see Figure 19)

Figure 19

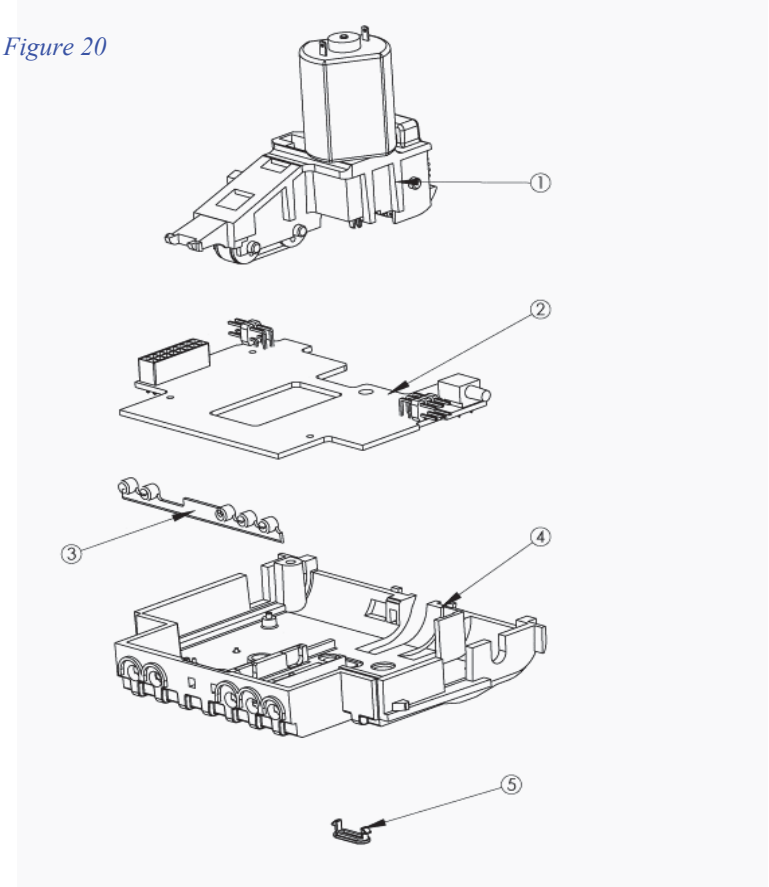


ITEM NO.	PART NO.	DESC.	QTY.
1	3A026	Lower Sensor Cover	1
2	04AA0020	Lower Sensor Microproccesor Board	1
3	AA003	Pinch Roller Assembly	4
4	40AA0005	Rear Pressure Roller Spring	4
5	3A015	Grey Scale	1
6	3A002	Lower Sensor Plate	1
7	5A004	Phone Jack Cable	1

6.3 Upper Sensor Plate Subassembly- AA032 (Shown), AA033

(see Figure 20)

Figure 20

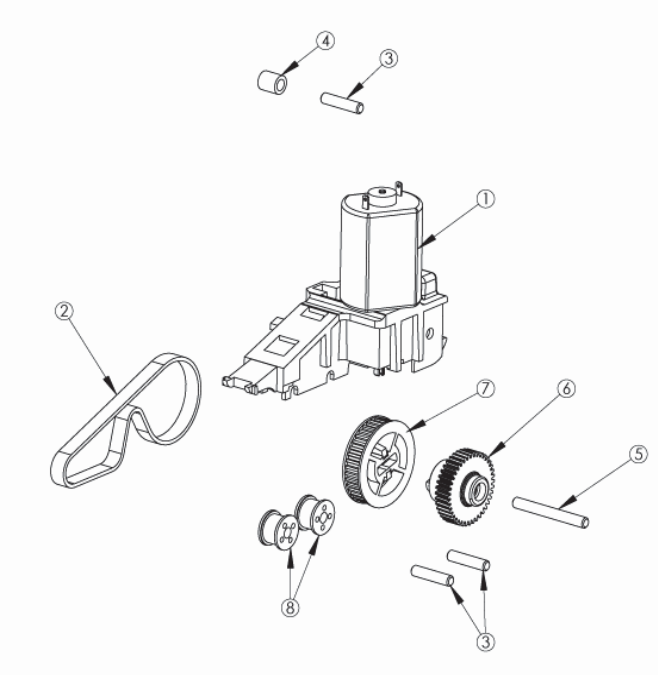


ITEM NO.	PART NO.	DESC.	QTY.
1	AA009	Drive Train Assembly	1
2	04AB019	Microprocessor Board	1
3	3A008	Upper Sensor Plate Front Window	1
4	3A001	Upper Sensor Plate	1
5	3A015	Grey Scale	1

6.4 Upper Sensor Plate Drive Train Assembly- AA009

(see Figure 21)

Figure 21

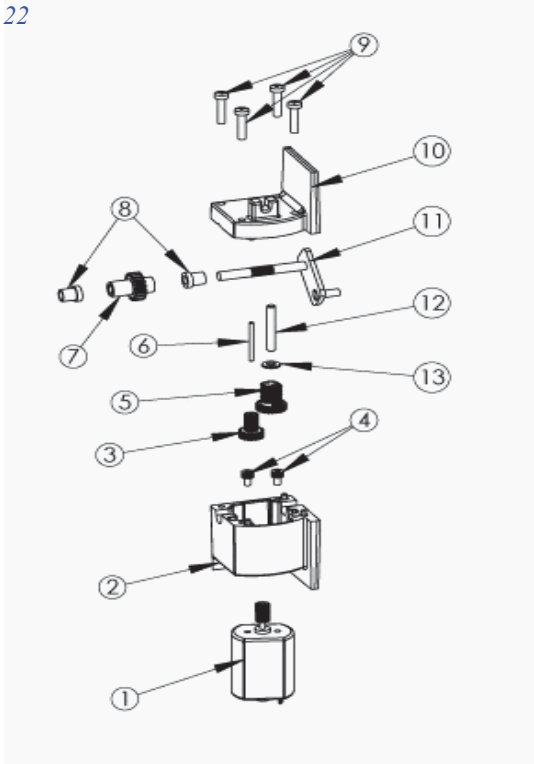


ITEM NO.	PART NO.	DESC.	QTY.
1	AA009	Drive Train Subassembly	1
2	7A000	Trilogy Belt	1
3	2A001	Small Shaft	3
4	3A022	Idler Roller	1
5	2A002	Drive Shaft	1
6	3A033	40 Tooth Worm Gear	1
7	AA001	Timing Pulley Assembly	1
8	30AA0025	Small Pulley	2

6.5 Stacker Motor Gear Box Subassembly- AA023

(see Figure 22)

Figure 22

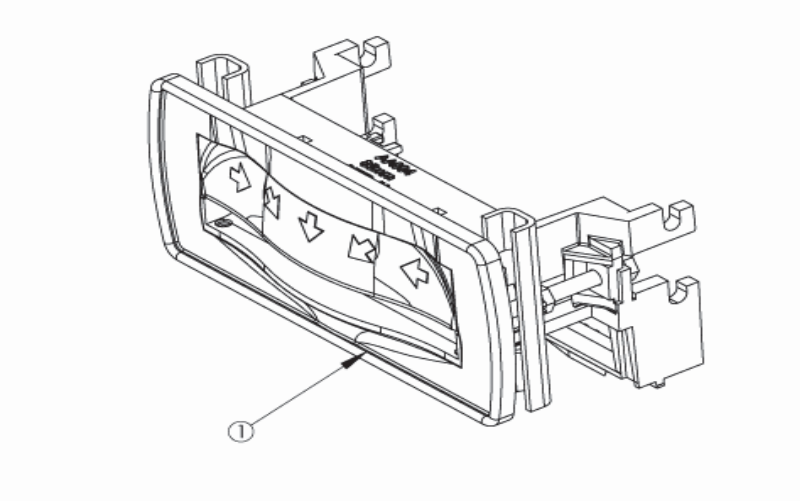


ITEM NO.	PART NO.	DESC.	QTY.
1	AA0017	Nichibo Motor, 12 VDC, UC-280P-19, 11 Tooth Brass Gear Assembly	1
2	3A056	Stacker Bottom Gear Housing	1
3	3A055	22 Plus 11 Gear	1
4	8A005	Socket Head Cap Screw	2
5	3A062	28 Tooth Spur/Worm Combo Gear	1
6	2A004	Spur Gear Combo Pin	1
7	3A061	18 Tooth Worm Gear	1
8	3A058	Shaft Bearing	2
9	8A011	Gear Train Box Screws	4
10	3A057	Top Gear Housing	1
11	AA0019	Cam w/ Knurled shaft	1
12	2A006	Worm Gear Shaft	1
13	8A007	#5 SAE Flat Washer	1

6.6 European Bezel – 85mm width- AA004

(see Figure 23)

Figure 23

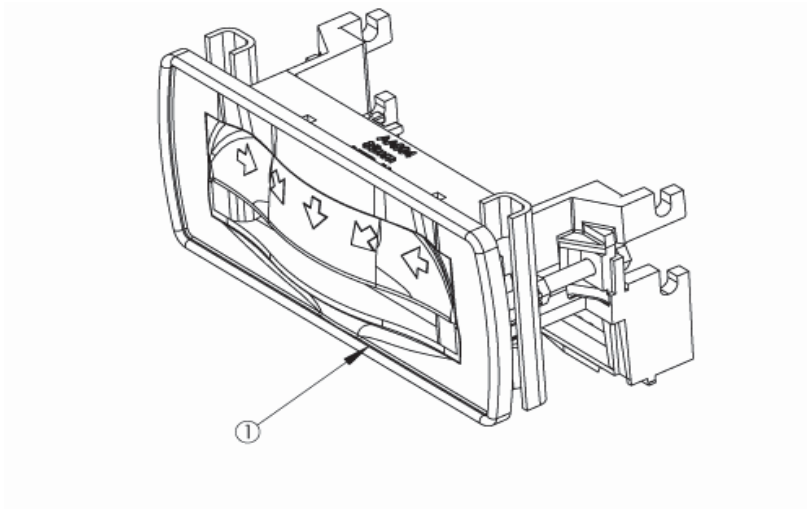


ITEM NO.	PART NO.	DESC.	QTY.
1	AA004	Euro Bezel Assembly	1

6.7 European Bezel – with width reducing inserts- AB664, AB724, AB744

(see Figure 24)

Figure 24

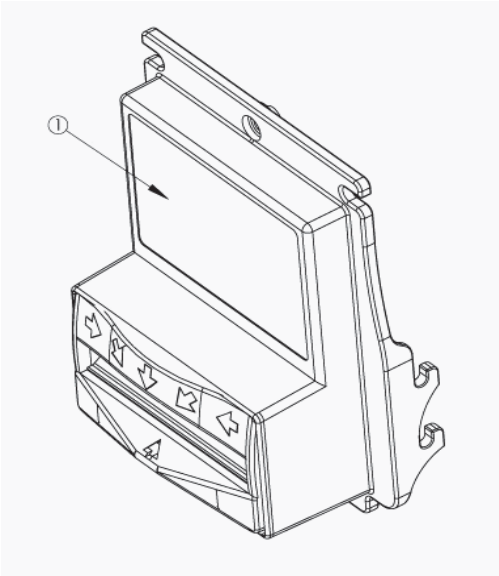


ITEM NO.	PART NO.	DESC.	QTY.
1	AB664, AB724, AB744	Euro Bezel Assembly with Inserts (66mm, 72mm, 74mm width reduction)	1

6.8 USA Style Bezel – 66mm, 72mm, or 74mm widths- AA005, AA006, AA007

(see Figure 25)

Figure 25

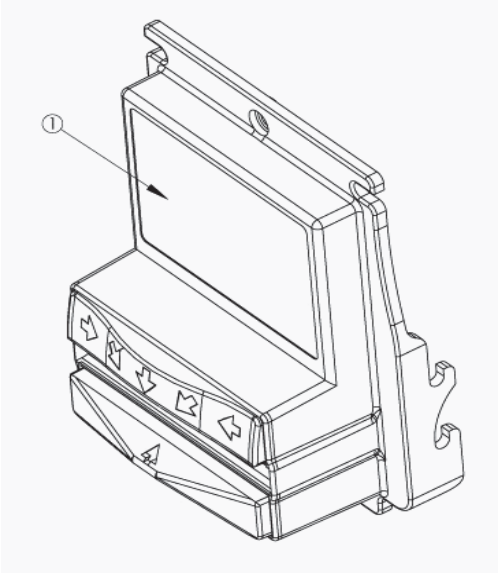


ITEM NO.	PART NO.	DESC.	QTY.
1	AA005, AA006, AA007	66mm, 72mm, or 74mm Bezel Assembly	1

USA Style Bezel – 82mm & 85mm width- AA014, AA015

(see Figure 26)

Figure 26

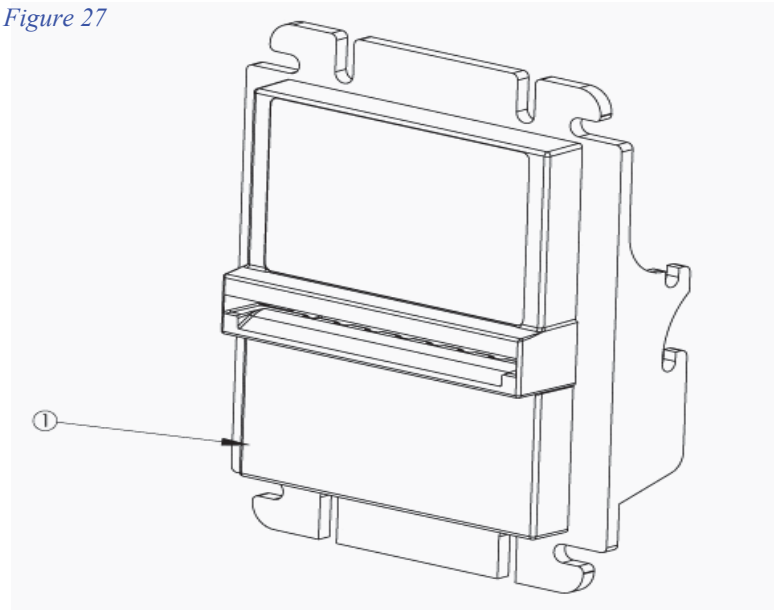


ITEM NO.	PART NO.	DESC.	QTY.
1	AA014, AA015	82mm, 85mm Bezel Assembly	1

6.9 82mm SP Bezel – 82mm width- 3B007

(see Figure 28)

Figure 27



ITEM NO.	PART NO.	DESC.	QTY.
1	3B007	82mm SP Bezel	1